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THE TRUE OBJECT OF WATER ANALYSIS

By Frank L. Rector, B.S., M.D.

The question of water analysis has been discussed from many angles, by many competent analysts. No uniform agreement has been reached, and doubtless will not be reached as long as waters of variable composition and source are examined.

It has been demonstrated repeatedly that no hard and fast rules can be promulgated for application to all classes of waters. The nearest attempt to this is the standard of impurity established by the United States Public Health Service for drinking water on interstate passenger carriers. To the writer it seems that the relation of the 37° C. count to the permissible gas production is not well balanced. This standard could not be met by many municipalities having what is ordinarily termed a safe supply. Problems entering into the consideration of a municipal supply are so many and varied that one standard for all is out of the question, unless unnecessary requirements are demanded of some.

Waters of surface origin and surface storage will show a different bacterial flora than those of underground source. In surface waters the 37° C. count doubtless suffices for most purposes. But in underground waters from safe sources the 20° C. count gives us much valuable information. In this latter class water organisms growing at 37° C. are, or should be, practically absent, and the 20° C. bacteria are the ones most commonly found.

The 37° C. organisms are looked upon with more distrust than are the 20° C. types; but each group tells its own story of past performances of a water and should be considered. We do not know that all 37° organisms are harmful, in fact we know they are not all harmful; neither do we know that all 20° C. organisms are harmless. Do we know definitely that among the large numbers of bacteria at 20° C. found at times in a water, there are none capable of setting up pathological conditions when taken into the system? Their presence in large numbers tends, at least, to show laxity in the care of that particular water.

As an illustration of the value of the 20° C. count the following results of analysis of filters may be cited. During the past year the writer made a study of the efficiency of filters as installed in homes and offices in Brooklyn. The 550 samples tested were about equally divided between raw and filtered water. The raw water gave a fairly low bacterial count, the average of some 60 analyses giving 28 bacteria at 37° C., and 217 at 20° C. The filter effluents frequently gave low counts at 37° C. but very high counts at 20° C. Had the 37° C. count only been considered, these appliances would have rated as efficient, when as a matter of fact, they were very inefficient, as regards bacterial removal. The following table from the results of the investigation illustrates this point:

RAW WATER		FILTERED WATER	
37°	20°	37°	20°
25	200	0	600
20	100	0	123
11	80	3	325
0	25	0	100
40	100	0	154
11	80	2	79
66	800	21	1,465
443	2400	220	25,000
12	390	7	420
3	80	1	150
6	35	1	230
6	75	0	125
8	50	1	100
27	1600	8	2,500
9	70	0	155

The samples noted above were plated within one hour after collection, and some in much less time, so there was no chance for multiplication between collection and plating.

Each source of water supply should be considered individually, and while general conclusions may be drawn, they must be applied with caution. Analysts should determine what elements in a given water supply, either chemical, bacteriological or microscopical, are subject to the widest variation, and after these facts are established, should devote their routine examination more closely to these variables. This will show more readily when changes occur and remedies can be applied more quickly.

The above suggestion necessitates frequent and regular examinations of water supplies, a thing which all will agree is highly important. A monthly or quarterly analysis is not sufficient no matter how safe a water is presumably. Analyses should be made weekly, or better daily. The more purification a water undergoes, the more frequently should it be analyzed in order to control the purification.

First hand knowledge regarding a water supply is of the greatest importance. A sanitary survey of the watershed takes equal place with laboratory analysis. The days of "absent treatment" in determining the sanitary condition of a water supply by analyzing a sample submitted with no knowledge of its previous history, are happily past.

In conclusion the writer would emphasize the necessity of a careful study of all influences bearing upon a given water, and a judicious use of that information, rather than judge all waters by a strict laboratory standard.